AS 4552—2005

Australian Standard™

Gas fired water heaters for hot water supply and/or central heating

This Australian Standard was prepared by Committee AG-001, Gas appliances. It was approved on behalf of the Council of Standards Australia on 21 September 2005.
This Standard was published on 8 December 2005.

The following are represented on Committee AG-001:

AGA (Network Operators)
AGA Certification Services
Appliance and Component Testing
Australian Liquefied Petroleum Gas Association
CSIRO Energy Technology
Committee AG-001-03
Consumers' Federation of Australia
Energy Retailers Association of Australia
Gas Appliance Manufacturers Association of Australia
Gas Technical Regulators Committee

This Standard was issued in draft form for comment as DR 04156.

Australian Standard™

Gas fired water heaters for hot water supply and/or central heating

Originated as AG 102—1976.
Previous edition May 2000.
Revised and redesignated AS 4552—2005.

Published by Standards Australia, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 7017 7

PREFACE

This Standard was prepared by the Standards Australia Working Group AG-001-00-11, Gas Water Heaters, under the responsibility of Standards Australia Committee AG-001, Gas Appliances. This edition is a substantial revision of the previous edition of AS 4552/AG 102:2000 to align with the expansion of the Scope. It supersedes AS 4552/AG 102 – 2000, *Gas Water Heaters*.

The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with uniform minimum requirements for the safety, performance and use of gas fired water heaters and central heating boilers for hot water supply and/or central heating.

This Standard should not be regarded as a design specification or as an instruction manual.

In its preparation, consideration has been given to—

(a) continuity of satisfactory operation;

(b) the prevention of fire hazards, and explosions;

(c) the prevention of injury to persons or property;

(d) gas rules and regulations now in force; and

(e) relevant International Standards.

AS 5601—Gas Installations, provides essential requirements and basic standards for gas installations.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

CONTENTS

Page

SECTION 1 SCOPE AND DEFINITIONS
1.1 SCOPE 5
1.2 DEFINITIONS 5

SECTION 2 DESIGN AND CONSTRUCTION
2.1 GENERAL 18
2.2 MATERIALS 20
2.3 ELECTRICAL SYSTEMS 22
2.4 INSTALLATION REQUIREMENTS 23
2.5 MAINTENANCE REQUIREMENTS 23
2.6 PRESSURE REGULATORS 25
2.7 GAS CONTROLS, SAFETY SHUT OFF SYSTEMS AND RELIEF DEVICES 25
2.8 COMBUSTION AIR SUPPLY AND CONTROLS 26
2.9 IGNITION, PILOTS AND MAIN BURNERS 26
2.10 FLUEING REQUIREMENTS 28
2.11 MARKINGS 30
2.12 INSTRUCTIONS 32

SECTION 3 PRELIMINARY TESTS - LINE GASES
3.1 GENERAL 35
3.2 PREPARATION FOR TESTING 35
3.3 GAS LEAKAGE 37
3.4 GAS CONSUMPTION 37
3.5 GAS PRESSURE REGULATORS 37
3.6 IGNITION AND SAFETY SHUT OFF SYSTEMS 38

SECTION 4 LIMIT GAS TESTS
4.1 GENERAL 41
4.2 CO/CO_2 RATIO LIMITS FOR ANY INDEPENDENT BURNER—OVERLOAD 41
4.3 CO/CO_2 RATIO LIMITS FOR PERMANENT PILOTS—OVERLOAD 41
4.4 FLAME CHARACTERISTICS AT MAXIMUM AND MINIMUM LIMITING CONDITIONS 41
4.5 BURNER IGNITION AT MAXIMUM AND MINIMUM LIMITING CONDITIONS 41
4.6 DELAYED IGNITION AT MAXIMUM AND MINIMUM LIMITING CONDITIONS 42
4.7 REIGNITION AT TURNDOWN UNDER DRAUGHT CONDITIONS 42
4.8 NOISE OF EXTINCTION 42
4.9 BURNER STABILITY WHEN CHANGING SETTING 42
4.10 PILOT IGNITION AND STABILITY AT MAXIMUM AND MINIMUM LIMITING CONDITIONS 42
4.11 EFFECT OF OPENING AND CLOSING DOORS AT TURNDOWN CONDITION 43
4.12 UNBURNT GAS RELEASE FROM BURNER SYSTEM 43
4.13 BURNER INTERFERENCE AT IGNITION OR DURING COMBUSTION 43

SECTION 5 PERFORMANCE TESTS-ALL APPLIANCES
5.1 GENERAL 44
5.2 DRAIN PERFORMANCE 44
5.3 CONDENSATION 44

Page

5.4 COMBUSTION AIR SUPPLY 44
5.5 RESPONSE TO ELECTRICAL POWER VARIATION OR FAILURE 45
5.6 TEMPERATURE HAZARDS 45
5.7 HEAT RESISTANCE 47
5.8 ENDURANCE OF COMPONENTS 47
5.9 FLUE OPERATION 48
5.10 OUTDOOR APPLIANCES AND TYPE 1 ROOM SEALED APPLIANCES 49
5.11 TYPE 2 ROOM SEALED APPLIANCES 50
5.12 LINTING TEST 51
5.13 RAIN TEST 51
5.14 STRENGTH 51
5.15 SPECIFICATIONS 51

SECTION 6 SPECIAL REQUIREMENTS FOR WATER HEATERS
6.1 MANUALLY OPERATED INSTANTANEOUS WATER HEATERS 52
6.2 AUTOMATIC INSTANTANEOUS WATER HEATERS 52
6.3 COLD WATER FEED TANK OVERFLOW 52
6.4 MARKING OF COLD WATER FEED TANK WATER LEVELS 52
6.5 ENERGY LABEL 52
6.6 STORAGE CAPACITY TOLERANCE FOR STORAGE WATER HEATERS 52
6.7 AUTOMATIC CONTROL 52
6.8 OPERATION OF RELIEF DEVICE OF UNVENTED WATER HEATERS CONTAINING LESS THAN 1L OF WATER 53
6.9 THERMAL EFFICIENCY 53
6.10 COMBUSTION PRODUCTS SPILLAGE DEVICE—STORAGE WATER HEATERS 54
6.11 ENDURANCE 55
6.12 ENERGY LABELLING 55

SECTION 7 SPECIAL REQUIREMENTS FOR CENTRAL HEATING BOILERS
7.1 MARKINGS 56
7.2 INSTRUCTIONS 56
7.3 THERMAL EFFICIENCY 56
7.4 ENDURANCE 57
7.5 THERMOSTATS AND WATER TEMPERATURE LIMITING DEVICES 57
7.6 EXPANSION VESSEL AND PRESSURE GAUGE 59

SECTION 8 SPECIAL REQUIREMENTS FOR COMBINATION APPLIANCES
8.1 COMBINATION APPLIANCES 60

APPENDICES
A FIGURES A1 to A7 61
B METHODS OF TEST 73
C WRITTEN APPLIANCE SPECIFICATIONS 178
D DIAGRAMMATIC REPRESENTATION OF OPERATING SEQUENCE FOR AUTOMATIC BURNERS 182
E METER VOLUME CORRECTION FACTORS 183
F LIST OF REFERENCED DOCUMENTS 185

STANDARDS AUSTRALIA

Australian Standard

Gas fired water heaters for hot water supply and/or central heating

SECTION 1 SCOPE AND DEFINITIONS

1.1 SCOPE

These requirements apply to gas water heaters and central heating boilers with natural draught or fan assisted combustion systems, intended for use with natural gas, town gas, liquefied petroleum gas (LPG) and tempered liquefied petroleum gas (TLP) with gas consumptions not exceeding 500 MJ/h, and includes types intended for the supply of hot water at a maximum temperature of 99°C for—

(a) sanitary, potable and drinking purposes;

(b) hydronic space heating; and

(c) a combination of (a) and (b).

NOTE: Other statutory and regulatory requirements may be applicable to the product(s) that fall within the scope of this Standard. It is the manufacturer's, importer's or distributor's responsibility (as appropriate) to ensure that products comply with such requirements.

1.2 DEFINITIONS

1.2.1 Adjustable control thermostat

An adjustable device enabling the water temperature to be maintained automatically, within a given range.

1.2.2 Ambient temperature

The temperature of the air surrounding the appliance, as measured by a dry bulb thermometer or equivalent.

1.2.3 Appliance flueway

A port or passage conveying flue gases within the appliance.

1.2.4 Appliance regulator

A device fitted to an appliance to control the gas pressure or gas volume delivered to that appliance.

1.2.5 Appliance ventilation duct

A duct through a building designed to bring combustion air from, and take products of combustion to, the outside air, for Type 2 room sealed appliances.

1.2.6 Atmospheric burner

A burner system where all the air for combustion is introduced by the inspirating effect of a gas injector and/or by the natural draught in the combustion chamber without mechanical assistance.

1.2.7 Authority having jurisdiction

The authority having statutory (legal) control.

1.2.8 Automatic flue damper device

A device, in the outlet of the primary flue of an individual automatically operated gas appliance, which is designed to automatically open the flue outlet during appliance operation and to automatically close off or restrict the flue outlet when the appliance is in the standby condition.

1.2.9 Automatic heat exchange water heater

An appliance in which water is heated by passing it through a heat exchanger immersed in heated water.

1.2.10 Automatic ignition

The lighting of gas at a burner without a manual operation whenever gas flows from the burner.

1.2.11 Automatic shut off valve

An automatic valve used to shut off gas supply to an appliance.

1.2.12 Available gas (line gas)

Readily available gas with similar characteristics to the reference test gas.

1.2.13 Bleed line

A small diameter pipe or tube that conveys gas to a safe place from a diaphragm valve other than one used for pressure regulators.

1.2.14 Burner port

The opening in a burner through which gas or an air/gas mixture issues to be ignited and burned.

1.2.15 Bypass

An integral part of a gas control that enables gas to bypass the control.

1.2.16 Capacity

The quantity of water measured in litres (L) contained within the storage vessel of a storage water heater.

1.2.17 Central heating boiler

An appliance that is designed to heat and supply water at a temperature not exceeding 99°C for hydronic heating purposes.

1.2.18 Certified

Assessed by a Certifying body, and having a certificate number to demonstrate compliance with a Standard.

1.2.19 Certifying body

A body acceptable to the Technical Regulator that provides assurance of compliance of appliances and components with nominated standards or other accepted safety criteria.

1.2.20 Circulator

A water heater in which water passes to a storage tank after heating.

NOTE: In the case of hydronic heating systems the term ‘circulator’ may refer to a pump.

1.2.21 CO/CO_2 ratio

The ratio by volume of carbon monoxide to that of carbon dioxide in the combustion products.

1.2.22 Combination gas control

An assembly of two or more different control functions in a single body.

1.2.23 Combination appliance

An appliance that is designed to perform the functions of both a central heating boiler and a water heater by means of two separate water circuits.

1.2.24 Combustion circuit

Circuit including the combustion chamber, the heat exchanger and the circuit permitting evacuation of the combustion products up to and including the flue connection (flued appliance) or flue terminal (flueless appliance).

1.2.25 Combustible materials

Materials made of or surfaced with wood, compressed paper, plant fibres or other materials that will ignite and burn.

1.2.26 Combustion products discharge safety device

A device that causes at least safety shutdown of the main burner when there is an unacceptable spillage of combustion products at the draught diverter.

1.2.27 Compression fitting

Compression fittings and components are as defined in AS/NZS 3500.0.

1.2.27.1 *Type 1 (non-manipulative) compression fitting*

A fitting for a compression joint that does not require any working of the tube other than cutting square. The joint is made tight by means of a loose compression ring that grips the outside wall of the tube when the coupling nut is tightened.

1.2.27.2 *Type 2 (manipulative) compression fitting*

A fitting in which the joint is made by flaring, croxing, capping or beading the end of the tube which is then compressed by the coupling nut against the shaped end of the corresponding section in the fitting.

1.2.28 Control thermostat

A preset device enabling the water temperature to be maintained automatically, within a given range.

1.2.29 Cross lighting

Lighting of one burner from another either directly or by means of an intermediate flame.

1.2.30 Determined gas consumption

Gas consumption rate measured in megajoules per hour (MJ/h) corrected to standard conditions, using reference gas at specified test pressures.

1.2.31 Drain valve

A valve in the bottom of the water vessel, through which the water may be drained from an appliance.

1.2.32 Draught diverter

A device, without moving parts, fitted in the flue of an appliance for isolating the combustion system from the effects of pressure changes in the secondary flue.

1.2.33 Drinking water

As defined in AS/NZS 4020.

1.2.34 Excess air

Air in excess of that required for complete combustion which is mixed unchanged with the combustion products, in the combustion chamber.

1.2.35 Expansion relief valve

A pressure actuated valve that automatically discharges water at a specified set pressure to prevent the pressure in the system exceeding the maximum working pressure during normal operation.

1.2.36 Fan assisted combustion system

A system (that is an integral part of the appliance) in which all or part of the combustion air is supplied and/or in which the products of combustion are evacuated by mechanical means.

1.2.37 Flame abnormality

A flame condition that results in lifting, floating, lighting back, carbon deposition or objectionable odour.

1.2.38 Flame detector

A device that is sensitive to flame properties and initiates a signal when flame is detected.

1.2.39 Flame establishment period

The period which begins when the fuel valve is energized and ends when the flame supervision system is first required to supervise that flame.

1.2.40 Flame proving period

The supervised period following the flame establishment period and before any further operation other than shutdown is permitted.

1.2.41 Flame safeguard

A safety device that automatically cuts off the gas supply if the actuating flame is extinguished.

1.2.42 Flame safeguard system

A system consisting of a flame detector(s) plus associated circuitry, integral components, valves and interlocks the function of which is to shut off the fuel supply to the burner(s) in the event of ignition failure or flame failure.

1.2.43 Flash tube

A device for igniting a gas burner in which a flame is made to travel to the burner ports through a tube in which an inflammable mixture of gas and air has been induced.

1.2.44 Flue

The passage through which flue gases are conveyed from an appliance to a discharge point (i.e. flue terminal), excluding draught diverter, barometric device, fan or similar part.

1.2.45 Flue connection

A device incorporated in an appliance for the connection of a flue system.

NOTE: Where the draught diverter, barometric device, fan or similar component is an integral part of the appliance, the discharge point of the integral part shall be deemed to be the flue connection.

1.2.46 Flue cowl

A fitting placed at the flue terminal of an open flued appliance, designed to prevent the entry of rain or the disturbing effect of wind, while not interfering with the discharge of flue gases.